

THE BIOLOGY OF THE EUROPEAN SPECIES OF THE
GENUS *ICHNEUMON* AND RELATED SPECIES
(HYMENOPTERA : ICHNEUMONIDAE)

Rolf Hinz

Fritz-Reuter Str. 34, D-3352 Einbeck, BRD.

There are many incorrect statements on the biology and hosts of the *Ichneumon* species in literature. Misidentifications are common, both in the names of the hosts and the ichneumonid species involved. The species of *Ichneumon* emerge from the host pupae and the identification of the pupae is not always easy.

To investigate the biology of the *Ichneumon* species, it became necessary to conduct experiments on oviposition. This was facilitated by the fact that nearly all *Ichneumon* species hibernate as gravid females. (Till now I have found only one exception: *Ichneumon deliratorius* L. hibernates in the host pupa). These hibernating females can easily be found from autumn till spring in well known places (Oehlke, 1967: 77; Hinz, 1968: 77) and with a suitable method it is possible to keep them in the refrigerator without mortality. Thus the breeding of the *Ichneumon* species can be attempted. It is possible without great difficulties if at the correct moment suitable hosts are available in sufficient numbers and of the right age. Thus the breeding of the *Ichneumon* species is reduced to a breeding of a large number of larvae and pupae of different Lepidoptera, which can be offered to the parasite.

As far as known all Ichneumoninae are parasites of the Lepidoptera. The assumption of Townes, that the oxygygous Ichneumoninae parasitize pupae and that the hosts of the amblygygous species are the larvae has been confirmed in all the cases. Sometimes the oxygygous species prick the prepupa (e.g. *Ichneumon caloscelis* Wesm. of several Satyridae). They move back from the intensely moving caterpillar and do not parasitize them perhaps because of the different structure of the surface. Some species accept, or perhaps prefer, recently transformed, often still uncolored pupae (e.g. *Ichneumon nebulosae* Heinz on *Polia nebulosa* Hufn.: Heinz, 1975: 256). This seems to be astonishing for the pupae lying in holes in the ground, but it is easily understood by the parasite's method to find the host: It follows the smell-trail the caterpillar leaves when it hides. Since the smell is not perceptible for a long time, there is a great probability for the parasite to find a young pupa.

When the parasite has entered the hole or found the cocoon of the host, the abdomen is bent and the ovipositor, supported by the ovipositor sheaths, is inserted vertically on the surface of the pupa. In fresh or slightly sclerotized pupae the pressure of the ovipositor is sufficient. Species that prick older or heavily sclerotized pupae, often have difficulties in oviposition. Turning the ovipositor back and forth helps its insertion into the pupa, when the female presses its back against the side of the cocoon. As a rule, after oviposition the female turns around and sucks the haemolymph oozing out at the site of the prick.

Most of the European species have only one generation per year. That causes an unusual long duration of life of more than eleven months for the female, since the development from oviposition till hatching of the imago requires in species of medium size around 25 days. During this time the females must feed, especially nectar of flowers, like those of the Umbelliferae. At suitable times probably all species can be found in such places.

Some of the common species, like *Ichneumon confusor* Grav., *melanotis* Hlgr., *molitorius* L., etc. have at least the potentiality of having several generations per year. This is regulated by photoperiodism: Under long day condition (16 hours) the ovaries of the females are fully developed 8-14 days after hatching. These species necessarily seem to be polyphagous, since univoltine species often are monophagous or oligophagous. It is difficult to state how many generations really appear in nature, since this can only be concluded from the appearance of fresh males. *Ichneumon* males can hardly be determined to species.

The ovaries of the hibernating females develop in spring with the increase of temperature. There is a real diapause during the winter, since it is rarely possible to induce the growth of the ovaries earlier by rise of temperature. It is probable that all *Ichneumon* species have arrhenotok parthenogenesis: in all species that I tested in this respect, the eggs of unfertilized females gave rise to males only.

Most of the species search for their hosts soon after hibernation in spring. They prefer the pupae of Lepidoptera hibernating as larvae (i.e. species of the genus *Amathes* and related species) or of butterflies flying early in the year (e.g. *Ichneumon inquinatus* Wesm. as parasite of several species of the genus *Orthosia*). Perhaps exceptions may be found in this respect. At this time I only know one in a genus related to *Ichneumon*: *Chasmius paludator* Desv. hibernates as imago, but oviposits not before August. The female parasitizes the pupae of butterflies of the genus *Nonagria* and *Archanara* living in the stems of *Typha* or *Phragmites communis*. It opens with its jaws the "windows" the caterpillar has prepared and thus reaches the pupa.

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